Claims

1. Adhesive bond between a substrate material having a surface and a solid region proximate to the surface comprised of polymer compounds with a low active surface energy, and another material,
characterized in that
a nano-structured transition region (6) comprising nano-composites (5) is formed between the connected materials (1, 4), in such a way that this region has a layer thickness between 20 nm and 20 μm and is predominantly formed of nano-composites (5), and that the ratio of substrate material (1) to the other material (4) in a direction transverse to the transition region changes from predominantly substrate material in the immediate vicinity of the substrate material (1) to predominantly the other material in the immediate vicinity of the other material (4), with the substrate material (1) transitioning into the other material (4) with a nano-structure.

2. Adhesive bond according to claim 1,
characterized in
that the transition region (6) comprises metal fractions and/or metal compounds, in particular nano-composites (5) containing metal polymers.

3. Adhesive bond according to claim 1 or 2,
characterized in that
the transition region (6) comprises diamond-like components, such as nano-composites (5) containing α-C:H.

4. Adhesive bond according to claim 1, 2 or 3,
characterized in that
the transition region (6) comprises nano-composites (5) containing fluoropolymers.

5. Method for producing an adhesive bond between a substrate material having a surface and a solid region proximate to the surface comprised of polymer compounds with a low active surface energy, and another material,

characterized in that
initially the solid region of the substrate material (1) proximate to the surface having polymer compounds with a low active surface energy is nano-indented, with the nano-indented surface (2) being activated by ion and/or ion beam and/or plasma and/or electron beam and/or laser beam process, and that immediately thereafter while the polymer molecules are still in an energetically, i.e., physically and/or chemically, excited state, or alternating with or in parallel with the activation, the other material is deposited particle-wise by PVD and/or CVD processes and/or cathode sputtering, until the polymer compound surface of the substrate material (1) with a low active surface energy is completely covered with the other material.

6. Method according to claim 5,
characterized in that
nano-indentation (2) of the solid region of the substrate material (1) proximate to the surface having polymer compounds with a low active surface energy is already performed in a separate pre-treatment process.

7. Method according to claim 5 or 6,
characterized in that
the particle-wise deposition of the other material occurs by PVD and/or CVD methods and/or cathode sputtering in such a way that beginning with a low deposition rate (few particles per unit time) at the beginning of the particle-wise deposition, the deposition rate is continuously or step-wise increased until formation of a complete coverage.

8. Method according to claims 5, 6 or 7,
characterized in that
if the other material (4) is not a metal, then metal fractions are deposited on the surface (2) of the substrate material (1) having the activated, nano-indented polymer compounds with a low active surface energy at the beginning or during the first phase of the particle-wise deposition of the other material (4).

9. Method according to one of the claims 5 to 8,

characterized in that
the solid region of the substrate material (1) proximate to the surface having the nano-indented polymer compounds with a low active surface energy is activated in a vacuum and the other material is also deposited particle-wise in a vacuum, preferably in a pressure region between $1x10^{-1}$ and $1x10^{-5}$ mbar.